



## Descriptions of three new species of *Dzhanokmenia* (Hymenoptera: Eulophidae) from China

QIN LI<sup>1,2</sup>, CHAO WANG<sup>1,2</sup>, HONG-YING HU<sup>1</sup>, VIKTOR V. KOSTJUKOV<sup>3</sup>,  
JOHN LA SALLE<sup>4</sup> & CHAO-DONG ZHU<sup>2,5,6</sup>

<sup>1</sup>College of Life Science and Technology, Xinjiang University, Urumqi, Xinjiang, 830046, P.R. China. E-mail: 572057391@qq.com; 249789835@qq.com; hoohyi-69@163.com

<sup>2</sup>Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing, 100101, P.R. China. E-mail: zhucd@ioz.ac.cn

<sup>3</sup>All-Russian Research Institute of Biological Plant Protection, Krasnodar-39, 350039, Russia. E-mail: salchia@yandex.ru

<sup>4</sup>Australian National Insect Collection, CSIRO National Facilities and Collections, Canberra, Australia.

E-mail: John.Lasalle@csiro.au

<sup>5</sup>College of Life Sciences, University of Chinese Academy of Sciences, No.19A Yuquan Road, Beijing 100049, China.

E-mail: zhucd2005@gmail.com

<sup>6</sup>Corresponding author. E-mail: zhucd@ioz.ac.cn

### Abstract

Three new species of *Dzhanokmenia* Kostjukov (Hymenoptera: Eulophidae: Tetrastichinae), *D. muleica* Li, Wang & Hu **sp. n.**, *D. karamayica* Li, Wang & Zhu **sp. n.** and *D. gobica* Li, Wang & Zhu **sp. n.** from Xinjiang Uyghur Autonomous Region of China are described and illustrated. A key to all known species of the genus is provided.

**Key words:** Chalcidoidea, taxonomy, desert, Junggar Basin, Palearctic

### Introduction

Tetrastichinae is the largest subfamily of Eulophidae. At present, this subfamily includes about 1900 species in more than 100 genera throughout the world (Noyes 2015).

Kostjukov (1977) discussed morphology, parasitism types, and host-parasitoid relationships of the genus *Tetrastichus* Haliday, 1844 (*s.l.*), within which he classified 17 subgenera, including *Dzhanokmenia* Kostjukov (type-species *Tetrastichus bibikovae* Dzhanokmen, 1971). Kostjukov (1978, 1984) subsequently described six additional species in *Dzhanokmenia* and provided a key to the seven species (Kostjukov 1984). In a revision of European Tetrastichinae, Graham (1991) noted that species of *Dzhanokmenia* were in most features similar to those of the *evonymellae* species-group of *Baryscapus* Förster, which he treated as a genus but Kostjukov (1977) as a subgenus of *Tetrastichus*. However, Graham (1991) listed several differential features between the two and because of these considered that *Dzhaokmenia* would form a discordant element if included in *Baryscapus*. He therefore recognized *Dzhanokmenia* as a valid genus, which we follow in this manuscript.

Since then, three additional species were described (Kostjukov 2014; Kostjukov & Kosheleva 2014, 2015), bringing the total number of species to ten. All the species were known exclusively from the arid to semi-arid regions of Southern Russia and Central Asia. During a biodiversity expedition of the Junggar Basin in the north of Xinjiang, individuals of *Dzhanokmenia* were found for the first time in China. Here we describe three new species of this genus and provide a key to all known species.

### Material and methods

All specimens of the new species were collected by sweep netting in the desert in Junggar Basin, Xinjiang Uyghur

Autonomous Region of China, and stored in 75% ethanol. The specimens were examined under a Motic stereomicroscope. Pictures of antennae were captured with a CANON 550D digital camera connected to a LEICA DM-2500 microscope. The images of other morphological characters were taken with a NIKON D7000 digital camera connected to a NIKON SMZ 1500 stereomicroscope. All images were stacked with Helicon Focus software (<http://www.heliconsoft.com>) and arranged in plates using Adobe Photoshop ([www.adobe.com](http://www.adobe.com)).

Description of the species is based on the holotype and variation noted from paratypic material is summarized in a separate section. Morphology and terminology follows Gibson (1997). Abbreviations of morphological terms used are: HW = head width; HL = head length; POL = distance between posterior ocelli; OOL = distance between eye and posterior ocellus; EH = height of eye; MSP = malar space; SL = length of scape; SW = width of scape; ML = length of mesosoma; MW = width of mesosoma; MLL = length of midlobe of mesoscutum; MLW = width of midlobe of mesoscutum; STL = length of scutellum; STW = width of scutellum; FWL = length of fore wing; FWW = width of fore wing; HWL = length of hind wing; HWW = width of hind wing; SMV = length of submarginal vein of fore wing; MV = length of marginal vein; CC = length of costal cell; STV = length of stigmal vein; PSV = length of parastigmal vein; PMV = length of postmarginal vein; F1–F4 = funicle segments 1–4; C1–C3 = claval segments 1–3; CL = length of clava; CW = width of clava; MFL = length of metafemur; MFW = width of metafemur; GL = length of metasoma; GW = width of metasoma; VP = length of ventral plaque on scape.

Acronyms for the specimen depositories are as follows: ICXU, Insect Collection of College of Life Science and Technology, Urumqi, Xinjiang, China; IZCAS, Institute of Zoology, Chinese Academy of Sciences, Beijing, China; UCRC, Entomology Research Museum, University of California, Riverside, California, USA; ZIN, Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia.

The key was compiled based on original descriptions of the species and examination of type material and other available determined specimens of species published previously by Dr. V. V. Kostjukov. Features in brackets represent additional features to help identify the species that are taken from the description of the species.

## Taxonomy

### *Dzhanokmenia* Kostjukov, 1977

*Tetrastichus* (*Dzhanokmenia*) Kostjukov, 1977: 189. Type-species: *Tetrastichus bibikovae* Dzhanokmen 1971, by original designation; Kostjukov, 1978: 430–467 (Key, in Russian).

*Dzhanokmenia* Kostjukov: Graham, 1991: 162–163 (elevated to generic rank); Kostjukov, 1984: 3435 (key); Kostjukov, 2014: 84 (diagnosis); Kostjukov & Kosheleva, 2014: 160 (diagnosis); Kostjukov & Kosheleva, 2015: 451 (diagnosis).

**Diagnosis.** Antenna usually yellow or yellowish, with 1–3 anelli and 3-segmented clava. Mesosoma convex, pronotum very short, transverse; midlobe of mesoscutum about as long as broad, with distinct or weak median line and a single row of adnotaular setae on each side; scutellum with two distinct longitudinal submedian lines and two setae behind the middle; propodeum with median carina, without plica. Tegula yellow. Fore wing only 1.7–2.1× as long as broad, with marginal vein and stigmal vein very thick, apical margin without setae; submarginal vein with only one dorsal seta; marginal vein very short, much shorter than costal cell. Metasoma slightly shorter than, equal to, or longer than mesosoma; metasomal tergites with yellow areas or completely dark.

**Distribution.** Palearctic: China (Xinjiang) [new record], Kazakhstan, Russia, and Turkmenistan.

**Hosts.** Unknown.

**Remarks.** The 13 described world species of *Dzhanokmenia* are tabulated below along with their known distribution and habitat, and where type material is deposited. Species of *Dzhanokmenia* key to *Baryscapus* using the key to genera of Tetrastichinae by Graham (1991), but differ in the features included in the above diagnosis. Only some species of the *evonymellae* group of *Baryscapus* possess some of the diagnostic features of *Dzhanokmenia*. For example, the fore wings of *B. embolicus* (Kostjukov) and *B. globosiclava* Graham have one seta on the SV; the fore wings of *B. elasmii* (Graham) and *B. tineivorus* (Ferrière) lack marginal cilia apically, and *B. evonymellae* (Bouché) has a yellow subbasal transverse band or large spot on the metasoma. All above five species do not have other diagnostic features of the genus *Dzhanokmenia*. Furthermore, no species of *Baryscapus* has a venation as that of *Dzhanokmenia*. We therefore treat *Dzhanokmenia* as a valid genus distinct from *Baryscapus*.

## Key to species of *Dzhanokmenia* (females)

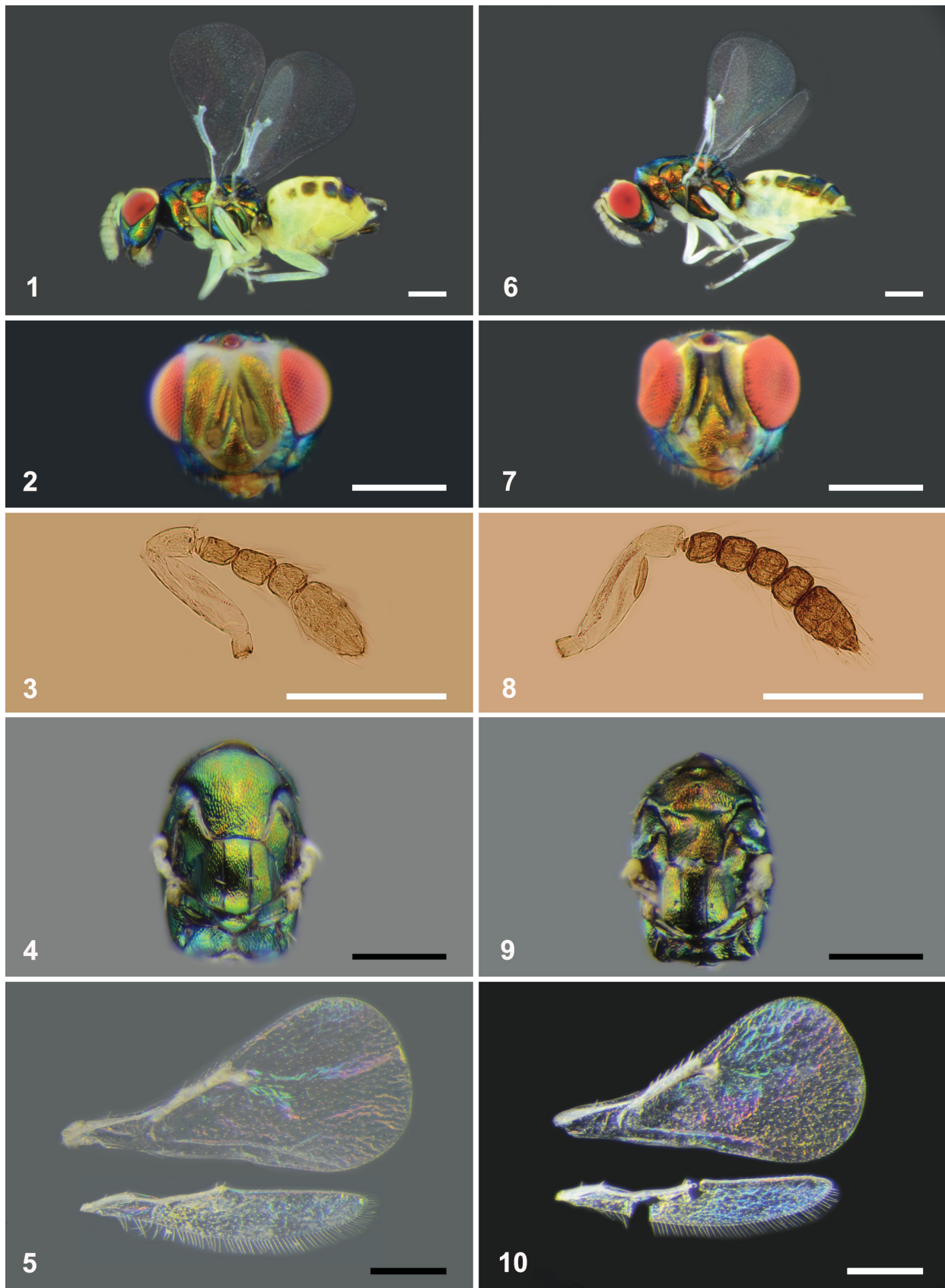
1	Metasomal tergites green, with bluish or bronze tint and metallic shine (Fig. 11) . . . . .	2
-	Metasomal tergites at least partially yellow or brown-yellow (Figs 1, 21). . . . .	7
2(1)	Meso- and metafemora yellow (Fig. 11) . . . . .	3
-	Meso- and metafemora dark . . . . .	6
3(2)	Funicular segments quadrate, as long as wide [clava slightly wider than funicle; scutellum slightly wider than its own length, dome-shaped, with distinct submedian lines; propodeum medially 0.3× as long as scutellum; metasoma 1.33× as long as mesosoma; hind wing extending to apex of metasoma; body dark blue, with metallic shine, scape (yellow) paler than funicle (brown), base of metasoma dark brown] . . . . .	<i>D. antonovae</i> (Kostjukov)
-	Funicular segments longer than wide (Fig. 13). . . . .	4
4(3)	Funicular segments unequal in length [F2 1.5× as long as F3; stigmal vein about 0.25× as long as marginal vein and parastigmal vein; body dark green with weak bronze patches, scape and pedicel pale brown, pro- and mesocoxae completely dark green]. . . . .	<i>D. nikolskajae</i> (Kostjukov)
-	Funicular segments equal in length (Fig. 13) . . . . .	5
5(4)	STV of fore wing less than 0.2× as long as MV and PSV; body green, without bronze tint; apical 1/4 of procoxa and apical 2/3 of mesocoxa yellow. . . . .	<i>D. zadepskyi</i> (Kostjukov)
-	STV of fore wing 0.3× as long as MV and PSV (Fig. 15); body green with yellow to orange reflections; coxae green with metallic tinge (Fig. 11) . . . . .	<i>D. karamayica</i> Li, Wang & Zhu <b>sp. n.</b>
6(2)	Funicle yellow, F2 2× as long as greatest width [clava wider than funicle; propodeum medially 0.5× as long as scutellum; body and coxae green, with metallic shine; antenna, tibiae and tarsi pale brown; femora dark brown, metafemur with metallic shine] . . . . .	<i>D. demakovi</i> (Kostjukov)
-	Funicle brown, F2 more than 2× as long as its own greatest width . . . . .	<i>D. kurdjumovi</i> (Kostjukov)
7(1)	Metasomal tergites yellow [mesoscutum with a longitudinal median line; metasoma 1.06× as long as mesosoma]. . . . .	<i>D. kozlovi</i> (Kostjukov)
-	Metasomal tergites only partially yellow or brown-yellow (Figs 1, 21). . . . .	8
8(7)	Metasoma predominantly yellow with tergites IV–VII brown-yellow. . . . .	9
-	Metasoma with dark or green metallic patterns on tergites (Figs 1, 21). . . . .	10
9(8)	Metasoma with tergites IV–VII brown-yellow; hind wing at least 9.0× as long as broad; median line on mesoscutum weakly expressed; metasoma as long as mesosoma. . . . .	<i>D. bibikovae</i> (Dzhanokmen)
-	Metasoma with only tergite VI brown-yellow; hind wing at most 7.5× as long as broad; median line on mesoscutum distinct; metasoma 1.4× as long as mesosoma . . . . .	<i>D. evgenyi</i> Kostjukov & Kosheleva
10(8)	POL at most 1.6× OOL . . . . .	11
-	POL at least 3.0× OOL . . . . .	12
11(10)	Scutellum at least 1.4× as broad as long; MV at least 2.9× as long as STV; body length 1.2–1.5 mm; MV 3.7–3.75× as long as STV. . . . .	<i>D. kasparyani</i> Kostjukov & Kosheleva
-	Scutellum at most 1.25× as broad as long; MV at most 2.5× as long as STV; body length 1.9–2.0 mm; MV 3.4–3.6× as long as STV. . . . .	<i>D. sugonjaevi</i> Kostjukov
12(10)	Vertex with a yellow area surrounding ocelli; metasoma with tergites I–IV laterally with round greenish-tinged spots, tergites V–VI green with metallic tinge and tergite VII yellow (Fig. 1) . . . . .	<i>D. muleica</i> Li, Wang & Hu <b>sp. n.</b>
-	Vertex without a yellow area surrounding ocelli; metasoma with tergites I–IV yellow, without round greenish-tinged spots, tergites V–VII green with strong metallic tinge (Fig. 21). . . . .	<i>D. gobica</i> Li, Wang & Zhu <b>sp. n.</b>

## New species descriptions

### *Dzhanokmenia muleica* Li, Wang & Hu, **sp. n.**

(Figs 1–10)

**Description.** FEMALE (Holotype, Fig. 1). Body length 1.3 mm, with blue, yellow and orange metallic reflections. Head mainly green with metallic tinge; vertex with a yellow area surrounding ocelli, inner part of ocellar triangle greenish with metallic tinge; eyes red; ocelli dark red; antennae with scape, pedicel and flagellum yellow; mandibles pale brown. Mesosoma green with metallic luster. Legs and coxae yellow or pale yellow except metacoxa with green metallic luster as on mesosoma and apical tarsomeres infusate. Color patterns on metasomal tergites symmetric: metasoma mainly yellow with oval-shaped greenish stain-like spots with metallic luster on sides of tergites I–IV, and tergites V–VI medially with larger spots. Ovipositor sheaths dark with green metallic reflections, apex of hypopygium brownish.



**FIGURES 1–10.** *Dzhankmenia muleica*. 1–5, female: 1, habitus (holotype), lateral; 2, head, frontal; 3, antenna, lateral; 4, mesosoma, dorsal; 5, wings. 6–10, male: 6, habitus, lateral; 7, head, frontal; 8, antenna, lateral; 9, mesosoma, dorsal; 10, wings. Scale bars: 0.2 mm.



Head (Fig. 2) with ocellar triangle, not surrounded by distinct grooves. POL  $3\times$  OOL. Malar space about  $0.5\times$  as long as height of eye. Scrobal area with distinct longitudinal median carina. Antennae inserted at level of lower margin of eyes. Malar sulcus strongly curved. Head  $1.4\times$  as wide as high,  $1.1\times$  as broad as midlobe of mesoscutum.

Antenna (Fig. 3) with scape  $4.5\times$  as long as wide, not reaching anterior ocellus; pedicel  $1.6\times$ , F1  $1.3\times$ , F2  $1\times$ , F3  $0.8\times$ , and clava  $1.6\times$  as long as wide; clava with sutures between clavomeres difficult to see; C3 short with rounded apex, without a terminal spine.

Mesosoma (Fig. 4)  $1.5\times$  as long as wide, convex. Pronotum medially very short in dorsal view. Midlobe of mesoscutum about as long as wide, with median line very weak, and with a single row of 3 adnotaular setae on each side. Scutellum  $1.06\times$  as long as wide, with anterior pair of setae in its posterior half, submedian and sublateral grooves strong and parallel to each other. Propodeum medially as long as dorsellum, with a median carina but without paraspiracular carina; callus with 4 or 5 setae; with a groove extending from spiracle to posterior margin of propodeum.

Fore wing (Fig. 5) hyaline,  $1.8\times$  as long as wide; CC  $2.64\times$  as long as MV; MV thick,  $4.0\times$  as long as wide; MV  $2.0\times$  as long as STV, with 6 marginal setae (about  $0.5\times$  as long as STV); STV rather thick; PSV not thicker than MV, very short, stub-like, less than  $0.5\times$  length of STV. Speculum large, extending from parastigma to stigmal vein. Discal setae short. Hind wing rounded apically,  $4.1\times$  as long as wide.

Legs. Metafemur  $3.9\times$  as long as wide.

Metasoma  $0.92\times$  as long as mesosoma,  $1.4\times$  as long as wide; hypopygium extending to about  $0.5\times$  length of metasoma; cercal setae subequal in length; ovipositor sheaths slightly protruding.

Variation. Body length: 1.1–1.3mm. Head with yellow area surrounding ocelli on vertex and metallic patterns on metasomal tergites varying from small to large. HW 1.3–1.4 $\times$  HL. POL 3.0–3.5 $\times$  OOL. EL 1.8–2.3 $\times$  MS. ML 1.5–1.7 $\times$  MW. STL 0.9–1.1 $\times$  STW. FWL 1.7–1.9 $\times$  FWW. HWL 3.7–4.9 $\times$  HWW. CC 2.4–2.6 $\times$  MV. MV 1.6–2.4 $\times$  STV. GL 1.5–1.9 $\times$  GW. MFL 3.4–4.0 $\times$  MFW.

MALE (Figs 6–10). Body length 1.2–1.3mm. Similar to female except as follows: funicle 4-segmented; scape with a pale brown ventral plaque that is  $0.3\times$  scape length; metasoma mainly yellow except anterior part of tergite I pale green; tergite IV medially yellow, with green spots on both sides; tergites V and VI green with a metallic shine. Fore wing with venation yellow, STV partially infusate. HW 1.3–1.8 $\times$  HL. POL 3.4–3.7 $\times$  OOL. EL 2.1–2.6 $\times$  MS. ML 1.7–1.8 $\times$  MW. STL 1.0–1.1 $\times$  STW. FWL 1.7–1.8 $\times$  FWW. HWL 3.7–4.8 $\times$  HWW. CC 1.2–1.9 $\times$  MV. MV 1.7–2.7 $\times$  STV. GL 1.6–1.9 $\times$  GW. MFL 3.3–4.0 $\times$  MFW. VP 0.26–0.28 $\times$  SL.

**Type material.** Holotype ♀ [ICXU], China, Xinjiang, Mulei, sweeping on *Ephedra*, *Haloxylon*, *Nitraria*, *Phragmites*, *Sagebrush*, 940m, 30.vii.2012, H. Hu group.

Paratypes (10♀, 6♂), China, Xinjiang, H. Hu group: Karamay, sweeping on *Haloxylon*, *Karelinia*, *Nitraria*, *Salsola*, *Tamarix*, 275m, 24.vii.2012 [1♀, 1♂, ICXU; 2♀, 1♂, IZCAS]. Mulei: sweeping on *Ceratocarpus*, *Haloxylon*, *Peganum*, *Salsola*, 761m, 29.vii.2012 [1♀, ICXU; 1♀, UCRC]; sweeping on the same plants as holotype, 940m, 30.vii.2012 [1♀, 1♂, IZCAS; 1♀, 1♂, ZIN]. Shihezi: sweeping on *Alhagi*, *Ceratocarpus*, *Haloxylon*, *Karelinia*, *Limonium*, 339m, 21.vii.2012 [1♀, 1♂, ICXU; 1♀, 1♂, IZCAS]; sweeping on *Reaumuria*, 346m, 22.vii.2012 [1♀, ICXU].

**Etymology.** The species is named after the collection locality of its holotype.

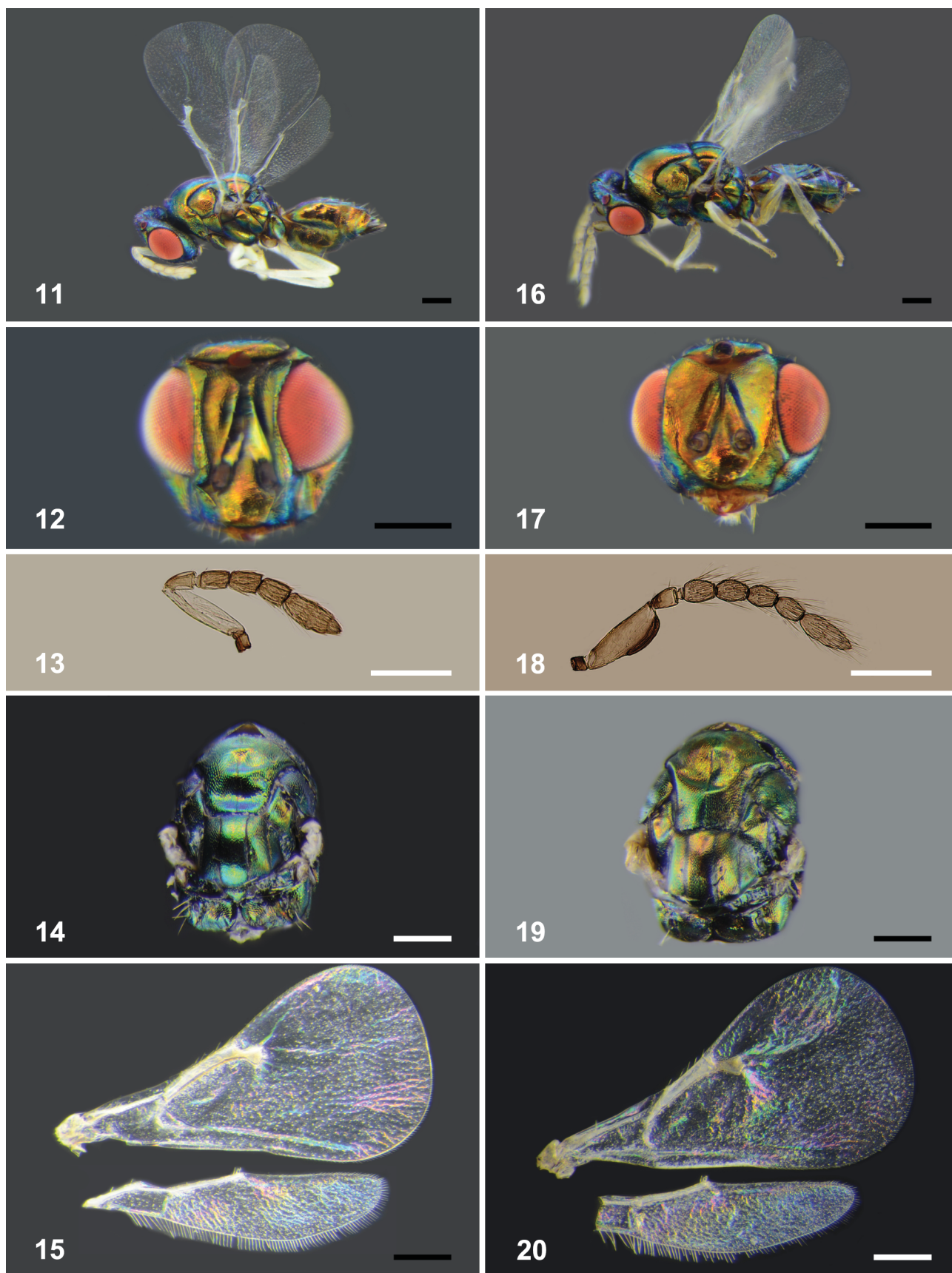
**Hosts.** Unknown.

**Diagnosis.** This species is similar to *D. kaspanyi*. It differs in the POL being more than  $3\times$  OOL, the vertex with a yellow area surrounding the ocelli, and metasomal tergites V and VI with green metallic tinge. In *D. kaspanyi* the POL is 1.45–1.6 $\times$  OOL, the vertex lacks the yellow area, and the metasoma is yellow except tergite VI is dark.

### ***Dzhanokmenia karamayica* Li, Wang & Zhu, sp. n.**

(Figs 11–20)

**Description.** FEMALE (Holotype, Fig. 11). Body length 1.6 mm, with yellow and orange reflections. Head green with metallic tinge, vertex without a yellow area surrounding ocelli; eyes red; ocelli dark red; antennae with scape and pedicel yellow, flagellum yellow to brown; mandibles dark brown. Mesosoma green with metallic tinge. Legs yellow except coxae green with metallic tinge like mesosoma and apical tarsomeres infusate. Metasoma green



**FIGURES 11–20.** *Dzhankmenia karamayica*. 11–15, female: 11, habitus (holotype), lateral; 12, head, frontal; 13, antenna, lateral; 14, mesosoma, dorsal; 15, wings. 16–20, male: 16, habitus, lateral; 17, head, frontal; 18, antenna, lateral; 19, mesosoma, dorsal; 20, wings. Scale bars: 0.2 mm.

with metallic tinge as mesosoma, without any yellow parts. Ovipositor sheaths dark with metallic luster under some angles of view, apex of hypopygium with green metallic tinge.

Head (Fig. 12) with ocellar triangle, surrounded by distinct grooves. POL  $3.2\times$  OOL. Malar space nearly  $0.4\times$  as long as height of eye. Scrobal area with a distinct longitudinal median carina. Antennae inserted at level of lower margin of eyes. Malar sulcus distinctly curved. Head  $1.3\times$  as wide as high,  $1.2\times$  as broad as midlobe of mesoscutum.

Antenna (Fig. 13) with scape  $2.75\times$  as long as wide, not reaching anterior ocellus; pedicel  $1.8\times$ , F1  $1.8\times$ , F2  $1.2\times$ , F3  $1.2\times$ , and clava  $2.5\times$  as long as wide, clava with sutures between clavomeres difficult to see; C3 short with rounded apex, without terminal spine.

Mesosoma (Fig. 14)  $1.4\times$  as long as wide, convex. Pronotum medially very short in dorsal view. Midlobe of mesoscutum as long as wide, with median line shallow but visible, and with a single row of 3 or 4 adnotaular setae on each side (sometimes not symmetrical). Scutellum  $1.19\times$  as long as wide, with anterior pair of setae in its posterior half, submedian and sublateral grooves distinct and parallel to each other. Propodeum medially almost as long as dorsellum ( $0.9\times$ ), with median carina distinct and without paraspiracular carina; callus with 5 or 6 setae; with a groove extending from spiracle to posterior margin of propodeum.

Fore wing (Fig. 15) hyaline,  $1.7\times$  as long as wide; CC  $1.8\times$  as long as MV; MV thick,  $3.4\times$  as long as wide; MV  $1.5\times$  as long as STV, with 7 marginal setae (about  $0.5\times$  as long as STV); STV rather thick; PSV not thicker than MV, very short, stub-like, less than  $0.5\times$  length of STV. Speculum large, extending from parastigma to stigmal vein. Discal setae short. Hind wing rounded apically,  $4.3\times$  as long as wide.

Legs. Metafemur  $3.8\times$  as long as wide.

Metasoma  $0.88\times$  as long as mesosoma,  $1.4\times$  as long as wide; hypopygium extending to  $0.5\times$  length of metasoma; cercal setae subequal in length; ovipositor sheaths slightly protruding.

Variation. Body length 1.6–2 mm. HW 1.3–1.6 $\times$  HL. POL 3.2–3.6 $\times$  OOL. EL 2.1–2.5 $\times$  MS. ML 1.4–1.7 $\times$  MW. STL 0.9–1.2 $\times$  STW. FWL 1.7–1.9 $\times$  FWW. HWL 4–4.8 $\times$  HWW. CC 1.6–1.8 $\times$  MV. MV 1.5–1.9 $\times$  STV. GL 1.5–1.8 $\times$  GW. MFL 3.3–3.8 $\times$  MFW.

MALE (Figs 16–20). Body length 1.3–1.8 mm. Similar to female except as follows: funicle 4-segmented; scape with large ventral plaque apically extending nearly half length of scape; STV partly infusate. HW 1.2–1.3 $\times$  HL. POL 3.0–3.4 $\times$  OOL. EL 2.0–2.5 $\times$  MS. ML 1.6–1.7 $\times$  MW. STL 0.9–1.0 $\times$  STW. FWL 1.7–1.75 $\times$  FWW. HWL 3.75–4.0 $\times$  HWW. CC 1.55–1.6 $\times$  MV. MV 1.6–1.8 $\times$  STV. GL 1.5–1.6 $\times$  GW. MFL 3.6–3.7 $\times$  MFW. VP 0.48–0.5 $\times$  SL.

**Type material.** Holotype ♀ [IZCAS], China, Xinjiang, Karamay, sweeping on *Nitraria*, *Suaeda*, *Tamarix*, 258m, 25.vii.2012, H. Hu group.

Paratypes (4♀, 7♂) China, Xinjiang, H. Hu group: Karamay, sweeping on the same plants as holotype, 258m, 25.vii.2012 [2♀, 6♂, IZCAS]; sweeping on *Elaeagnus*, *Haloxylon*, *Phragmites*, *Populus*, *Reaumuria*, *Tamarix*, 287m, 24.vii.2012 [1♀, 1♂, ICXU]. Mulei, sweeping on *Ceratocarpus*, *Haloxylon*, *Peganum*, *Salsola*, 761m, 29.vii.2012 [1♀, ICXU].

**Etymology.** The species is named after the collection locality of its holotype.

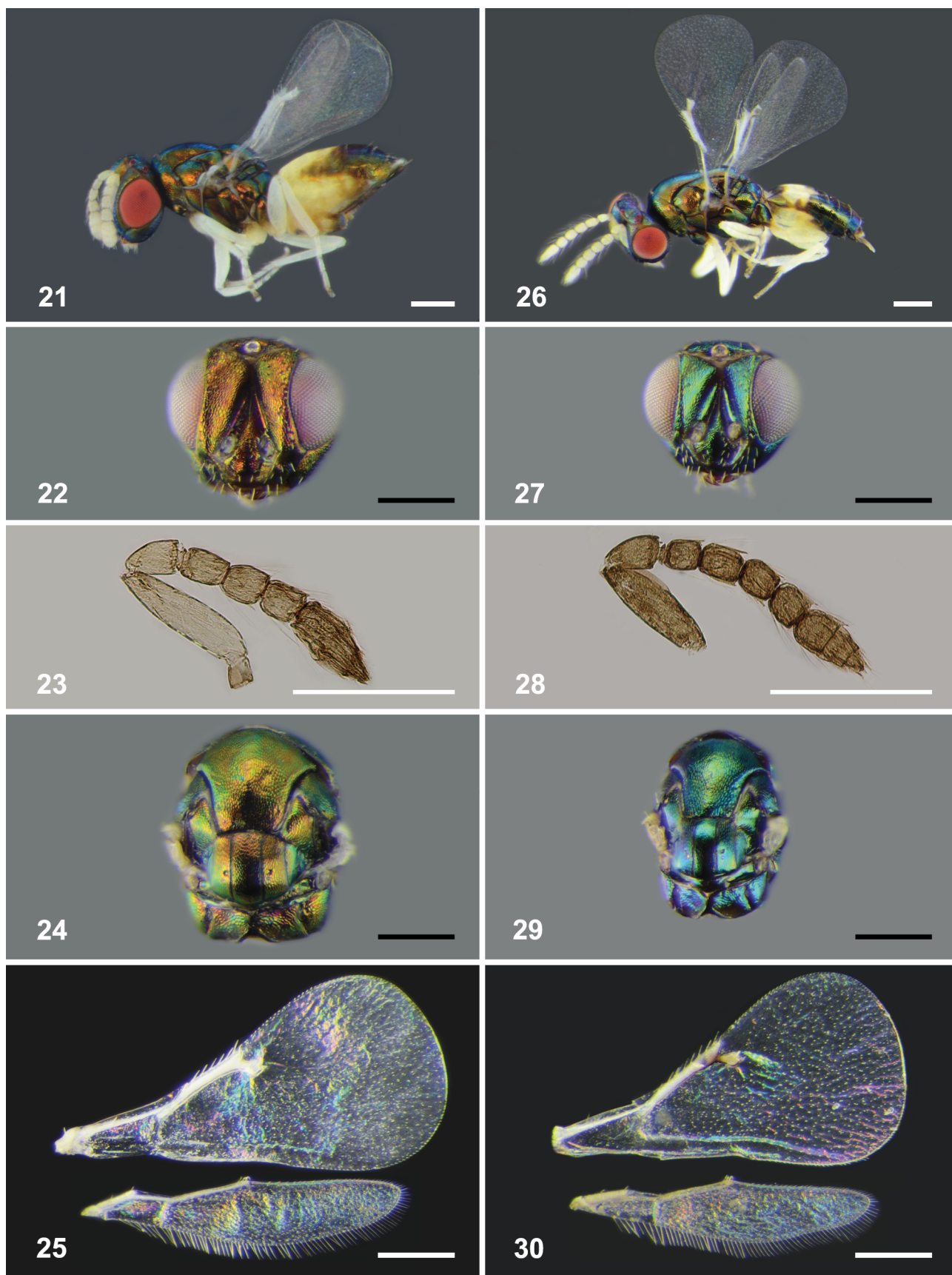
**Hosts.** Unknown.

**Diagnosis.** This species is similar to *D. zadepskyi*. It differs in the STV being only  $0.3\times$  as long as MV plus PSV, the procoxa has the apical 1/5 yellow to brown, and the mesocoxa is green with metallic tinge. In *D. zadepskyi* the STV is  $0.16\times$  as long as MV plus PSV, the procoxa has apical 1/4 and the mesocoxa has the apical 2/3 yellow.

### ***Dzhanokmenia gobica* Li, Wang & Zhu, sp. n.** (Figs 21–30)

**Description.** FEMALE (Holotype, Fig. 21). Body length 1.3 mm, with blue, yellow and orange metallic reflections. Head green with metallic tinge, vertex without a yellow area surrounding ocelli; eyes red; ocelli dark red; antennae with scape, pedicel and flagellum yellow; mandibles dark brown. Mesosoma green with strong metallic tinge. Legs and coxae yellow or pale yellow except metacoxa with green metallic luster as on mesosoma and apical tarsomeres infusate. Color patterns on metasomal tergites symmetric: anterior part of tergite I with green tinge; tergites I–III yellow, median and anterior parts of tergite IV yellow, laterally with pale green metallic





**FIGURES 21–30.** *Dzhankmenia gobica*. 21–25, female: 21, habitus (holotype), lateral; 22, head, frontal; 23, antenna, lateral; 24, mesosoma, dorsal; 25, wings. 26–30, male: 26, habitus, lateral; 27, head, frontal; 28, antenna, lateral; 29, mesosoma, dorsal; 30, wings. Scale bars: 0.2 mm.



tinge; tergites V–VII with green metallic tinge. Ovipositor sheaths dark with metallic reflections, apex of hypopygium with green metallic tinge.

Head (Fig. 22) with ocellar triangle, not surrounded by distinct grooves. POL  $3.5\times$  OOL. Malar space  $0.42\times$  as long as height of eye. Scrobal area with a distinct longitudinal median carina. Antennae inserted at level of lower margin of eyes. Malar sulcus strongly curved. Head  $1.2\times$  as wide as high,  $1.5\times$  as wide as midlobe of mesoscutum.

Antenna (Fig. 23) with scape  $4\times$  as long as wide, not reaching median ocellus; pedicel  $1.4\times$ , F1  $1.7\times$ , F2  $1.4\times$ , F3  $1.25\times$ , and clava  $2.3\times$  as long as wide; clava with sutures between clavomeres difficult to see; C3 short with rounded apex, without a terminal spine.

Mesosoma (Fig. 24)  $1.6\times$  as long as wide. Pronotum medially very short in dorsal view. Midlobe of mesoscutum as long as wide, with median line very weak, and with a single row of 3 adnotaular setae. Scutellum  $0.8\times$  as long as broad, with anterior pair of setae in its posterior half, submedian and sublateral grooves distinct and parallel to each other. Propodeum medially as long as dorsellum, with a median carina but without paraspiracular carina; callus with 4 or 5 setae; with a groove extending from spiracle to posterior margin of propodeum.

Fore wing (Fig. 25) hyaline,  $1.9\times$  as long as wide; CC  $2\times$  as long as MV; MV thick,  $4\times$  as long as wide; MV  $1.7\times$  as long as STV, with 6 marginal setae (about  $0.3\times$  as long as STV); STV rather thick; PSV not thicker than MV, very short, stub-like, less than  $0.5\times$  length of STV. Speculum large, extending from parastigma to stigmal vein. Discal setae short. Hind wing rounded apically,  $5.5\times$  as long as wide.

Legs. Metafemur  $4.8\times$  as long as wide.

Metasoma as long as mesosoma,  $1.8\times$  as long as wide; hypopygium extending to about  $0.5\times$  length of metasoma; cercal setae subequal in length; ovipositor sheaths slightly protruding.

Variation. Body length 1.1–1.3mm. Metallic patterns on metasomal tergites vary from small to large. HW  $1.2\text{--}1.3\times$  HL. POL  $3\text{--}3.5\times$  OOL. EL  $1.8\text{--}2.4\times$  MS. ML  $1.5\text{--}1.6\times$  MW. STL  $0.8\text{--}0.9\times$  STW. FWL  $1.8\text{--}1.9\times$  FWW. HWL  $4.8\text{--}5.5\times$  HWW. CC  $1.8\text{--}2\times$  MV. MV  $1.7\text{--}2.5\times$  STV. GL  $1.7\text{--}1.8\times$  GW. MFL  $3\text{--}4.8\times$  MFW.

MALE (Figs 26–30). Body length 1.01.3mm. Similar to female except as follows: funicle 4-segmented; scape with pale to light brown, ventral plaque apically,  $0.33\times$  length of scape; metasoma with area of yellow smaller than for female; STV partly infusate. HW  $1.2\text{--}1.25\times$  HL. POL  $3.7\text{--}4.3\times$  OOL. EL  $1.8\text{--}2.1\times$  MS. ML  $1.6\text{--}1.7\times$  MW. STL  $0.9\text{--}1.1\times$  STW. FWL  $1.7\text{--}1.8\times$  FWW. HWL  $4.8\text{--}5.1\times$  HWW. CC  $1.8\text{--}1.9\times$  MV. MV  $1.7\text{--}2.1\times$  STV. GL  $1.75\text{--}1.9\times$  GW. MFL  $3.0\text{--}3.4\times$  MFW. VP  $0.4\text{--}0.43\times$  SL.

**Type material.** Holotype ♀ [IZCAS], China, Xinjiang, Shihezi, sweeping on *Alhagi*, *Ceratocarpus*, *Haloxylon*, *Karelinia*, *Limonium*, 339m, 21.vii.2012, H. Hu group.

Paratypes (10♀, 8♂), China, Xinjiang, H. Hu group: Tacheng, sweeping on *Caragana*, *Haloxylon*, *Tamarix*, 609m, 26.vii.2012 [1♂, ICXU]. Karamay, sweeping on *Haloxylon*, *Nitraria*, *Suaeda*, *Tamarix*, 274m, 23.vii.2012 [2♀, ICXU]; sweeping on *Elaeagnus*, *Haloxylon*, *Phragmites*, *Populus*, *Reaumuria*, *Tamarix*, 287m, 24.vii.2012 [3♀, 6♂, ICXU]; sweeping on *Haloxylon*, *Nitraria*, *Suaeda*, 251m, 25.vii.2012 [1♀, 1♂, ICXU]. Mulei, sweeping on *Haloxylon*, *Salsola*, 725m, 29.vii.2012 [1♀, ICXU]. Shihezi, sweeping on *Alhagi*, *Ceratocarpus*, *Haloxylon*, *Karelinia*, *Limonium*, 339m, 21.vii.2012 [2♀, IZCAS; 1♀, UCRC].

**Etymology.** The species is named after the habitat type (Gobi Desert) of the new species.

**Hosts.** Unknown.

**Diagnosis.** This species is similar to *D. kasparyani*. It differs in POL being at least  $3\times$  OOL, the hind wing  $4.8\text{--}5.5\times$  as long as broad, metasomal tergite III yellow, and metasomal tergite IV yellow medially and anteriorly but laterally with pale green metallic tinges. In *D. kasparyani* the POL is  $1.45\text{--}1.6\times$  OOL, the hind wing  $8.0\text{--}9.5\times$  as long as broad, and metasomal tergites III–IV are completely metallic with a strong metallic tinge.

## Conclusion and discussion

The description and illustration of the three new species from the Junggar Basin desert and the key provided to described species contribute to our understanding of *Dzhanokmenia* and the fauna of the studied region. At present, 13 valid species of *Dzhanokmenia* from the arid to semi-arid regions of Southern Russia and Central Asia are known. However, hosts remain to be discovered for any of the species. Basing on our field studies, *Haloxylon* and *Tamarix* were present in almost all sampling sites. We consider they are most likely associated with these plants, feeding on them or as parasitoids of their pests. Therefore, we plan to focus on *Haloxylon* and *Salsola* to make sure

whether they are phytophagous or parasitic. This would be very meaningful because *Haloxylon* and *Tamarix* are important desert forest components in Xinjiang (Xinjiang Uyghur Autonomous Region of China) for wind prevention and sand fixation, especially in the desert.

**TABLE 1.** Described species of *Dzhanokmenia* with known distribution and habitat, and deposition of type material.

Species	Distribution	Habitat	Deposition of type material
<i>D. antonovae</i> (Kostjukov 1978)	Kazakhstan, Russia (Stavropolsky Kray, Ulyanovsk Oblast)	desert and semidesert	ZIN
<i>D. bibikovae</i> (Dzhanokmen 1971)	Kazakhstan	desert	ZIN
<i>D. demakovi</i> (Kostjukov 1978)	Russia (Stavropolsky Kray, Astrakhan Oblast)	desert and semidesert	ZIN
<i>D. evgenyi</i> (Kostjukov & Kosheleva 2015)	Russia (Stavropolsky Kray)	semidesert	ZIN
<i>D. gobica</i> Li, Wang & Zhu <b>sp. n.</b>	China (Xinjiang)	desert	ICXU, IZCAS, UCRC
<i>D. karamayica</i> Li, Wang & Zhu <b>sp. n.</b>	China (Xinjiang)	desert	ICXU, IZCAS
<i>D. kasparyani</i> (Kostjukov & Kosheleva 2014)	Russia (Stavropolsky Kray)	semidesert	ZIN
<i>D. kozlovi</i> (Kostjukov 1984)	Russia (Stavropolsky Kray), Turkmenistan	desert and semidesert	ZIN
<i>D. kurdjumovi</i> (Kostjukov 1978)	Kazakhstan, Russia (Stavropolsky Kray)	desert and semidesert	ZIN
<i>D. muleica</i> Li, Wang & Hu <b>sp. n.</b>	China (Xinjiang)	desert	ICXU, IZCAS, UCRC
<i>D. nikolskajae</i> (Kostjukov 1984)	Turkmenistan	desert	ZIN
<i>D. sugonjaevi</i> (Kostjukov 2014)	Turkmenistan (Repetek)	desert	ZIN
<i>D. zadepskyi</i> (Kostjukov 1984)	Russia (Stavropolsky Kray), Turkmenistan	desert and semidesert	ZIN

## Acknowledgements

Several members from Dr. Hu's (Hong-ying Hu) group, Jian-wei Guo, Fu-xiang Dong, Xiu-li Tang, Jia-xiong Lu, and Fei Zheng were involved in the field trips to deserts in July 2012. Pictures used for the illustrations were taken, stacked and prepared by Mr. Chao Wang in Dr. Zhu's lab, with help from Dr. Ze-Qing Niu and Miss Huan-Xi Cao. We thank Serguei V. Triapitsyn (UCRC) for reviewing the earlier drafts of the manuscript and for making many suggestions towards its improvement. The work was supported by the Xinjiang Postgraduate Technology Innovation Project (XJGRI2015022) and the National Natural Science Foundation of China (U1170305, J1211002).

## References

- Dzhanokmen, K.A. (1971) Noviy vid *Tetrastichus* (Hymenoptera, Tetrastichidae) is yugo-vostochnogo Kazakhstan. *Zoologicheskij Zhurnal*, 50, 1883–1884.
- Gibson, G.A.P. (1997) Chapter 2. Morphology and terminology. In: Gibson, G.A.P., Huber, J.T. & Woolley, J.B. (Eds.), *Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera)*. NRC Research Press, Ottawa, pp. 16–44.
- Graham, M.W.R. de V. (1991) A reclassification of the European Tetrastichinae (Hymenoptera: Eulophidae): revision of the remaining genera. *Memoirs of the American Entomological Institute*, 49, 1–322.
- Kostjukov, V.V. (1977) Comparative morphology of chalcids of the subfamily Tetrastichinae and the system of the genus *Tetrastichus* Haliday, 1844 (Hymenoptera, Eulophidae). *Entomologicheskoe Obozrenie*, 56 (1), 177–194. [in Russian with

English summary]

- Kostjukov, V.V. (1978) Subfam.5. Tetrastichinae. In: Medvedev, G.S. & Trjapitzin, V.A. (Chief Ed. & Ed.), *Keys to the insects of the European part of the USSR. Vol. III. Hymenoptera, Part 2*. Nauka, Leningrad, 430–467. [in Russian]
- Kostjukov, V.V. (1984) New species of the genus *Tetrastichus* Haliday, 1844 (Hymenoptera, Eulophidae) from Turkmenistan. In: *Entomophagues of the orchards pests*. Shtiintsa, Kishinev, pp. 30–35. [in Russian]
- Kostjukov, V.V. (2014) New species of *Dzhanokmenia* Kostjukov, 1977 and *Kolopterna* Graham, 1987 (Hymenoptera, Eulophidae, Tetrastichinae) from Turkmenistan. *Biological Plant Protection as the basis of ecosystem stabilization of Agroecosystems*, 8, 84–91. [in English with Russian summary]
- Kostjukov, V.V. & Kosheleva, O.V. (2014) New species of *Dzhanokmenia* Kostjukov and *Kolopterna* Graham (Hymenoptera: Eulophidae: Tetrastichinae) from Russia. *Proceedings of the Russian Entomological Society*, 85 (1), 160–164.
- Kostjukov, V.V. & Kosheleva, O.V. (2015) A new species of the eulophid-wasp genus *Dzhanokmenia* Kostjukov, 1977 (Hymenoptera, Eulophidae: Tetrastichinae) from Stavropol Territory. *Entomologicheskoe Obozrenie*, 94 (2), 451–454. [in Russian with English summary]  
<http://dx.doi.org/10.1134/s0013873815040144>
- Noyes, J.S. (2015) *Universal Chalcidoidea database*. WWW publication. The Natural History Museum, London. Available from: <http://www.nhm.ac.uk/research-curation/projects/chalcidoids/index.html> (accessed October 2015)